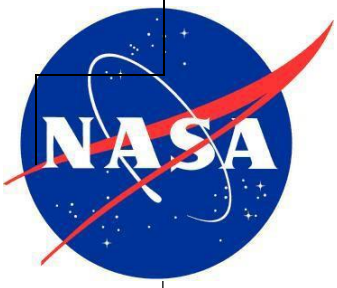
# Balloon Program Office
## Code 820

# Mission Manager
# Day of Launch Procedure
# Fort Sumner

**Effective Date**
**October 2019**

**820/Balloon Program Office**

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# CHANGE HISTORY LOG

| REVISION | EFFECTIVE DATE | DESCRIPTION OF CHANGES |
|---|---|---|
| - | October 3, 2019 | Original Issue.<br>Complete revision of the Mission Manager Launch Procedure. Replaces all previous versions. |
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# 1 INTRODUCTION

## 1.1 Purpose

NASA Balloon Program Office (BPO) Mission Manager (MM) Preflight and Flight-line Launch Operations, and authorization criteria for Fort Sumner conventional balloon missions.

## 1.2 Scope

This procedure outlines the steps and authorizations necessary to conduct launch operations performed by the Columbia Scientific Balloon Facility (CSBF) at Fort Sumner, New Mexico under the auspices of the BPO and CSBF. This document will be maintained by the BPO and distributed to the WFF Safety Office, and serves as official record in conduct of the mission. Other official operational records will be maintained by CSBF, refer to CSBF flight documentation if discrepancies are noted with regard to operational aspects between this and CSBF records.

## 1.3 Definitions / Acronyms

| | |
|---|---|
| ACER | Advanced Collar Electronics Radio |
| BPO | Balloon Program Office |
| CC | Crew Chief |
| CM | Campaign Manager |
| COR | Contract Officer's Representative |
| CSBF | Columbia Scientific Balloon Facility |
| ELS | Equivalent Level of Safety |
| FD | Flight Director |
| FS | Flight Safety |
| FSP | Flight Safety Plan |
| GSE | Ground Support Equipment |
| GS | Ground Safety |
| GSP | Ground Safety Plan |
| HAZOP | Hazardous Operation |
| IRT | Interim Response Team |
| LDA | Launch Danger Area |
| LDB | Long Duration Balloon |
| LECC | Launch Equipment Configuration Certification |
| LHA | Launch Hazard Area |
| LLA | Launch Limit Area |
| LSI | Launch Stress Index |
| MM | Mission Manager |
| MPCP | Mishap Preparedness and Contingency Plan |
| MRR | Mission Readiness Review |
| MRSO | Mission Range Safety Officer |
| NLSA | Nuclear Launch Safety Assessment |
| NM | Nautical Miles |
| OSS | Operations Safety Specialist |
| PPE | Personnel Protective Equipment |
| POC | Point Of Contact |

| | |
|---|---|
| RAR | Risk Analysis Report |
| SPB | Super Pressure Balloon |

## 1.4 Resource Requirements

- BPO Mission Manager (MM)
- CSBF Operations Personnel
- NASA Safety Mission Range Safety Officer (MRSO)
- Certified Operational Safety Specialist (OSS)

## 1.5 Documentation

- Balloon Risk Analysis
- Ground Safety Plan
- Flight Safety Plan
- Operations Hazard Area Maps
- Waiver, ELS, Exception (if applicable)
- Hazardous Operations Procedures

## 1.6 Personal Protective Equipment and Material Requirements

- Ear Plugs
- Enclosed Shoes (safety toe shoes)
- Hard Hat (as needed)
- Safety Glasses (as needed)
- High Visibility Safety Vest
- Interim Response Team (IRT) Go Kit

## 1.7 Training Requirements

- IRT training
- Mission Manager On-The-Job training.

## 1.8 Safety Information

### 1.8.1 Team Roles and Responsibilities

#### 1.8.1.1 Safety Responsibilities

Generic responsibilities are given in the Goddard Directives Management System document, GSFC – STD-8009.

Mission specific responsibilities are listed in the Ground Safety Plan (GSP) and Flight Safety Plan (FSP). Reporting and monitoring responsibilities are listed in this document.

All mission essential personnel working around launch operations shall be trained and informed of all hazards. Only essential personnel shall be involved in hazardous operations. The MM and OSS shall

ensure non-essential personnel remain outside the hazard areas and may designate additional personnel to ensure safety compliance, as needed. CSBF CM will ensure that roadblocks are put in place, as required.

Refer to the campaign specific flight safety plan for the roles and responsibilities during integration, operations, launch, launch abort, and flight termination. Refer to the campaign specific FSP for the launch abort criteria and termination criteria.

## 1.9 References

| | |
|---|---|
| OF-603-02-C | Mechanical/Stored Energy |
| OF-322-15-C | High Pressure |
| OF-434-00-C | Helium Compression Operations |
| ES-100-20-P | CSBF Ordnance Procedure (collar only) |
| ACER-PROC-007 | ACER Preflight Checkout Procedure |
| ACER-PROC-008 | ACER Flight Line Checkout |

## 1.10 Quality Assurance

Confirmation of each operation shall be noted by the MM. The MM shall sign at the bottom of Pre-Launch Operations and Launch Day Operations sections to confirm that all actions have been closed. Go/No Go authorizations shall be initialed within this launch procedure. The Weather Briefing section is for notation only.

## 1.11 Quality Records

Quality Records for this process are noted below along with specific file locations. Unless otherwise noted, the retention time will be 3 years after delivery of all items and/or completion of all services called for by the contract.

| Record | File Location |
|---|---|
| NA | NA |

## 2 MISSION READINESS

| | |
|---|---|
| Campaign | Fort Sumner |
| Flight Line Coordinates | N 34.49 W 104.22 |
| Scientist / Instrument | |
| Lead MM | |
| Lead MRSO | |
| CSBF Campaign Manager (CM) | |
| Lead CSBF Crew Chief (CC) | |
| Operations Support Specialist (OSS) – Ordnance | |
| OSS – Lifting | |
| OSS – Pressure | |

****************************End of Operations****************************

# 3 PREFLIGHT CHECKOUT

**NOTE**
Elements of this plan may be non-applicable to certain missions and will be redlined. It is required of the MM to ensure adequate documentation. Essential personnel are required to conduct the following operations in full adherence to safety.

**1.** Verify hard hats, safety vests and safety glasses are being used by all applicable parties. ☐

**2.** Verify OSS and MRSO are ready on day of launch. ☐

**3.** Verify Launch Hazard Areas are in place and deemed adequate by MRSO. ☐

**NOTE**
Launch Hazard Area Diagram is in Appendix B

**WARNING**
The following hazardous operation requires an ordnance OSS.

**4.** Verify with OSS that "CSBF Ordnance Preflight / Flight Line / Post Flight Procedures, ES-100-20-P" current revision are completed through squibs checks. ☐

**5.** Confirm Work Rules are in compliance with NPR 1800.1 (or within Approved Exception). ☐

Exception Requirements: _____

**6.** Verify with LDB engineer that Advanced Collar Electronics Radio Preflight Checkout Procedure ACER-PROC-007 current revision is completed. ☐

**(No updates or notes required)** ☐

**7.** List the Interim Response Team (IRT) assigned roles/responsibilities from the Mission Manager Flight Readiness Checklist: ☐

| Responsibility | Name |
|---|---|
| IRT Lead | |
| Mishap Scene Security Coordinator | |
| Chain of Custody Coordinator | |
| Handling and Impound Coordinator | |
| Debris Identification Specialist | |
| Written Witness Statement Coordinator | |
| Photographic Support | |
| Secured Website/IT Support | |
| Office of Communications Advisor | |

**Record** any notes on notification list, as required, below:

_____

_____

_____

**(No updates or notes required)** ☐

**8.** List any updates to impound locations, from the Mission Manager Mission Flight Readiness Checklist for the following: ☐

Debris: _____

Equipment: _____

Data: _____

**9.** Record the Meteorologist supporting launch operation forecasting: ☐

Meteorologist_____Date _____

**10.** Record NOTAM information. ☐

NOTAM issued number: _____

****************************End of Operations****************************

## 4 PREFLIGHT LINE READINESS

**NOTE**
Perform the following steps if Science Team is performing a Hazardous Operation.

**WARNING**
The following hazardous operation requires an ordnance OSS.

**(Below Step 1 Not Performed)** ☐

**1.** Verify Science is ready to perform hazardous operations and OSS is present. Document hazardous operation procedure. ☐

Procedure Title/Number: _____

**(Below Step 2 Not Performed)** ☐

**2.** Verify Science HazOp procedures are completed. ☐

**3.** Verify Science Readiness for pickup. ☐

Document #: _____

**4.** Ensure Lifting OSS availability for pickup. ☐

**5.** Verify CSBF is taking photos/videos of balloon layout activities. ☐

**********End of Operations**********

## 5 GONDOLA PICKUP

**WARNING**

The following operation requires the OSS presence and is hazardous due to personnel working around suspended loads. Steel or composite toed shoes are required during all in indoor operational areas. Hard hats are required during all lifting operations. Working under suspended loads is prohibited. Refer to 800-PG-1700.1.1.

1. Verify OSS is present. ☐

2. Confirm clearance of all non-mission essential personnel, make sure rollout path is clear / marked and Launch Limit Area is clear prior to rollout. ☐

**NOTE**

Pre-Launch Danger Area Diagram and Launch Hazard Areas Diagram (containing the Launch Limit Area) are located in Appendix B

****************************End of Operations****************************

## 6 PRE-BALLOON LAYOUT

**WARNING**

The following operation requires the OSS presence and is hazardous due to personnel working around suspended loads. Steel or composite toed shoes are required during all in indoor operational areas. Hard hats are required during all lifting operations. Working under suspended loads is prohibited. Refer to 800-PG-1700.1.1.

**1.** Confirm MRSO GO prior to Flight Train Layout and range is clear. ☐

**NOTE**

Perform the following step if Science Team is preforming a hazardous operation or requires access to Gondola.

**(Below Step Not Performed)** ☐

**2.** Verify Science HazOp Procedures / Launch Pad work is completed and all non-essential personnel have cleared the hazard area. ☐

Procedure Title/Number: _____

**3.** Verify with LDB engineer that ACER Collar Electronics Radio Flight Line Checkout Procedure ACER-PROC-007 current revision is completed (preflight line checks). ☐

****************************End of Operations****************************

## 7 PRE-BALLOON INFLATION

**WARNING**
The following operation requires the OSS presence and is hazardous due to personnel working around suspended loads. Steel or composite toed shoes are required during all in indoor operational areas. Hard hats are required during all lifting operations. Working under suspended loads is prohibited. Refer to 800-PG-1700.1.1.

**NOTE**
Launch Hazard Area diagram in Appendix B

1. Record Final Layout Direction (from)_____(degrees). ☐

2. Verify and document, 7 seconds balloon termination cutter installation. Take photos of payload as it hangs, with parachute. ☐

**WARNING**
The following operation requires the OSS presence and is hazardous due to personnel working around suspended loads. Steel or composite toed shoes are required during all in indoor operational areas. Hard hats are required during all lifting operations. Working under suspended loads is prohibited. Refer to 800-PG-1700.1.1.

3. Verify with OSS that "CSBF Ordnance Preflight / Flight Line / Post Flight Procedures ES-100-20-P" current revision is completed through installation and checks of terminate / separation fittings and vent valve. ☐

****************************End of Operations****************************

## 8 BALLOON INFLATION

**WARNING**
The following operation requires the OSS presence and is hazardous due to personnel working around suspended loads. Steel or composite toed shoes are required during all in indoor operational areas. Hard hats are required during all lifting operations. Working under suspended loads is prohibited. Refer to 800-PG-1700.1.1.

**1.** Verify GO for inflation and NOTAM is active. ☐

**NOTE**
Pre-Launch Danger Area Diagram in Appendix B

**2.** Confirm Operations Area is clear of all Center Essential / Non-essential personnel. ☐

**3.** Provide Approval to Proceed for inflation (GO/NO GO). ☐

**WARNING**
The following operation requires the OSS presence and is hazardous due to personnel working around suspended loads. Steel or composite toed shoes are required during all in indoor operational areas. Hard hats are required during all lifting operations. Working under suspended loads is prohibited. Refer to 800-PG-1700.1.1.

**4.** Verify OSS utilizes OSS Checklist and "Balloon Inflation Operations, OF-322-15-C" current revision is completed in its entirety upon conclusion of operation. ☐

**(Below Step 6 Not Performed)** ☐

**5.** In the event of an anomaly prior to spool release, perform Contingency Operation A-1: Balloon Anomaly Pre-Spool Release in Appendix A of this document. ☐

****************************End of Operations****************************

## 9 PRE-LAUNCH READINESS

1. Verify balloon inflation nominal and complete. ☐

**NOTE**
The following steps may be performed out of sequence prior to the launch, including in-parallel with inflation.

**WARNING**
The following operation requires the OSS presence and is hazardous due to personnel working around suspended loads. Steel or composite toed shoes are required during all in indoor operational areas. Hard hats are required during all lifting operations. Working under suspended loads is prohibited. Refer to 800-PG-1700.1.1.

2. Verify collar installation is in work. ☐

3. Verify CSBF is taking photos/videos of collar / ACER box after installed and prior to ACER activation. ☐

**NOTE**
Collar Installation is performed concurrent to Balloon Inflation within the launch hazard area. The OSS may oversee Collar Installation once Balloon Inflation is underway and nominal.

4. Verify with OSS that "CSBF Ordnance Preflight/Flight Line/Post Flight Procedures, ES-100-20-P," current revision is completed through collar pyro installation. ☐

5. Verify with LDB engineer that ACER Collar Electronics Radio Flight Line Checkout Procedure ACER-PROC-008 current revision is completed. ☐

6. Verify with CM ACER Launch Operations Procedure is on hand ready to go. ☐

****************************End of Operations****************************

## 10 BALLOON LAUNCH OPERATIONS

**NOTE**
Pre-Launch Danger Area and Launch Hazard Area Diagrams are located in Appendix B

**1.** Confirm Operations Readiness. ☐

**2.** Verify MRSO and FAA approval for launch are given. ☐

**3.** Confirm Launch Crew is in Position and perform Communication Checks. ☐

**4.** Provide Approval to Proceed with Launch. ☐

**5.** Verify nominal Spool Release. ☐

**NOTE**
The next two steps do not have to be performed in sequence.

**6.** Verify nominal Collar Release. ☐

**7.** Verify nominal Pin Release. ☐

**NOTE**
The following two steps are MRSO call abort/terminate scenarios for balloon post-spool release. MM will document any issues that cause an abort in the comment section below. If balloon launch is nominal "Do Not Perform" the next step.

**(Below Step 7 Not Performed)** ☐

**8.** In the event of anomaly post-spool release, perform Contingency Operation A-2, Balloon Anomaly Post Spool Release in Appendix A of this document. ☐

**(Below Step 8 Not Performed)** ☐

**9.** MRSO will provide the call for ABORT, if (indicate condition): ☐

| | |
|---|---|
| The **payload launch vehicle travels outside the Launch Limit Area** and is heading in a direction where the public or mission personnel would be in danger. | |
| The balloon is released from the spool, but the **balloon exhibits anomalous characteristics and the payload is still attached to the payload launch vehicle**, then the Launch Crew Chief or CM may call for an abort. | |
| The **payload impacts or drags outside the Launch Limit Area**. | |

Abort Comments:

_____

_____

_____

**NOTE**
The following step is the MRSO call to terminate scenario for balloon post-pin release. MM will document any issue that caused termination in comment section below. If nominal balloon launch, "Do Not Perform" the next step.

**(Below Step 10 Not Performed)** ☐

**10.** MRSO will provide call for TERMINATION, if (indicate condition): ☐

Termination Comments:

_____

_____

_____

**11.** Record Balloon Release Date/Time (Z): ☐

Date:_____Time: _____

**NOTE**
Essential personnel are not released from station until MRSO verifies nominal balloon ascent and gives the all clear.

****************************End of Operations****************************

## 11 POST LAUNCH

**(Below Step 1 Not Performed)** ☐

1. In the event of anomaly post pin release, perform Contingency Operation A-3, Balloon Anomaly Post Pin Release in Appendix A of this document. ☐

2. Record launch conditions: ☐

   Surface Direction / Speed_____@_____Sky Conditions _____

   Low Level Direction / Speed_____@_____Temperature C _____

   Layout Direction_____ Crosswind _____

3. Provide post launch summation below (notate launch conditions, spool/pin release, issues, etc.): ☐

POST LAUNCH REPORT:

_____
_____
_____
_____
_____

****************************End of Operations****************************

# Appendix A Contingency Operations

## Contingency Operation A-1: Balloon Anomaly Pre-Spool Release – Balloon in spool

**NOTE**
Perform the following operation if a balloon anomaly requiring termination of the balloon launch is required pre-spool release.

**(Entire Operation A-1 Not Performed)** ☐

**1.** MRSO ensure only mission essential to the balloon terminate operation are inside the PLDA. Ensure LDA is still clear of all non-essential and center essential. MM provide GO to terminate balloon by closing helium supply valves. ☐

**NOTE**
Perform the next step if balloon inflation is still being performed.

**(Below Step 2 Not Performed)** ☐

**2.** Abort balloon inflation by closing helium supply valves. ☐

**3.** Open balloon helium valves on APEX fitting. ☐

**4.** Cut balloon to facilitate balloon deflation upon allowing balloon to vent through the APEX valves. ☐

**5.** Secure launch scene. ☐

**6.** Contact BPO Chief to determine further direction on incident. ☐

**************************End of Operation A-1***************************

## Contingency Operation A-2: Balloon Anomaly Post Spool Release

**NOTE**
Perform the following operation if a balloon anomaly requiring abort (active or passive) of the balloon launch is required post spool release.

**(Entire Operation A-2 Not Performed)** ☐

1. Crew Chief on his own or after receiving call from CM, MRSO, MM calls for abort (passive or active). ☐
2. Abort balloon by opening EV-13 and/or firing terminate fitting to release balloon only. ☐
3. MRSO and MM provides all clear to the CM to allow additional mission essential to be within the danger area. ☐
4. Secure launch scene. ☐
5. Notify BPO Chief of an abort. ☐
6. MM/MRSO release the LDA and LHA upon completion of data/collection and any IRT evidence collection. ☐

******************************End of Operation A-2******************************

## Contingency Operation A-3: Balloon Anomaly Post Pin Release

**NOTE**
Perform the following operation if a balloon anomaly requiring termination of the balloon launch is required post pin release.

**(Entire Operation A-3 Not Performed)** ☐

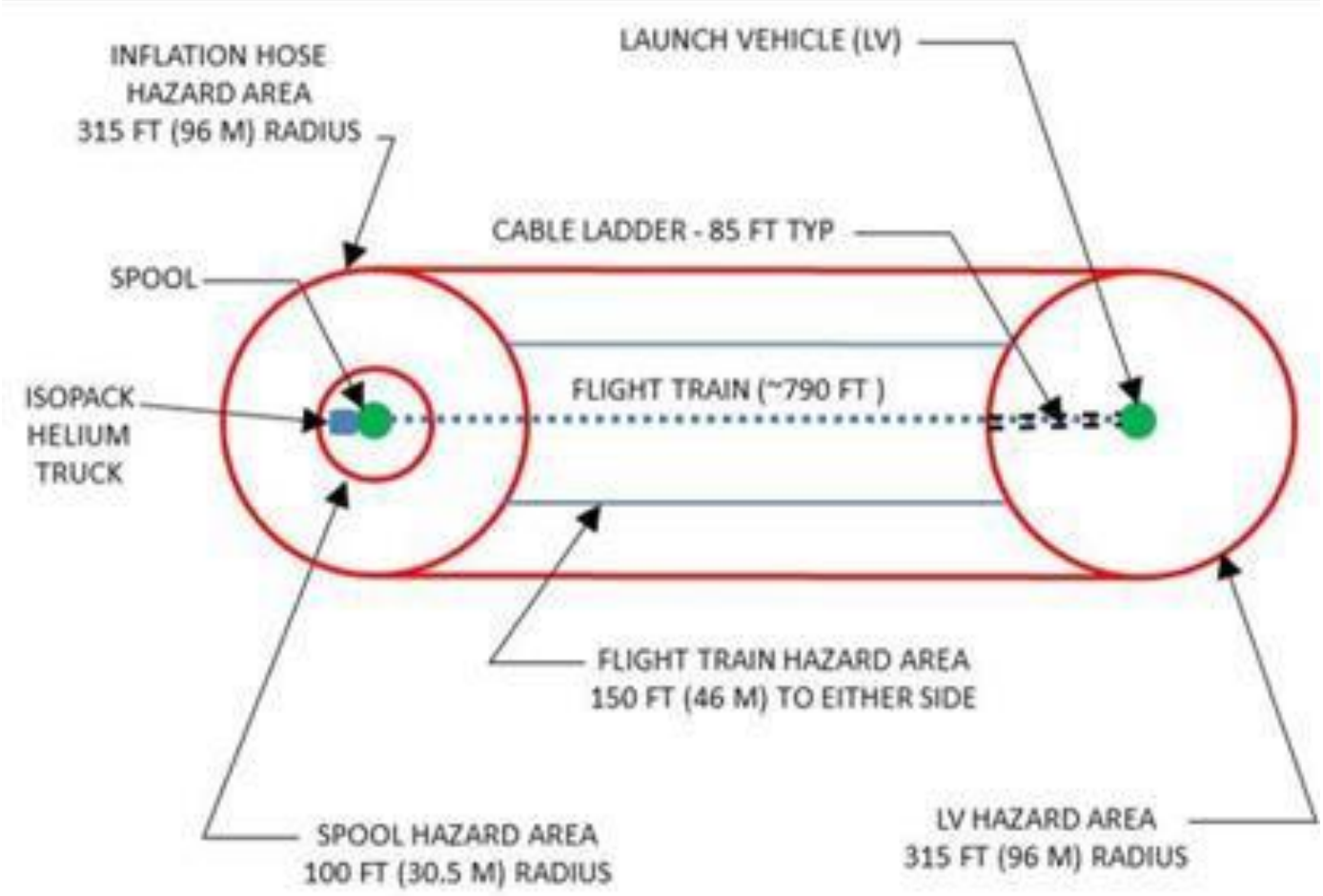
1. MRSO clear all personnel from balloon descent area and seek shelter in place until gondola has impacted. ☐
2. Verify descent of balloon is not in high population or restricted area (if possible). ☐
3. Terminate balloon per nominal termination procedures. ☐
4. MRSO provide approval for mission essential personnel to enter descent area. ☐
5. Prepare recovery team for balloon recovery requirements for potenital evidence collection. ☐
6. Contact BPO Chief to determine further direction on incident. ☐

****************************End of Operation A-3****************************

# Appendix B-Hazard Areas

## Pre-Launch Danger Area (PLDA)

The **PLDA** for the balloon launch vehicle is defined by a 96 m (315 ft.) radius circle about the Launch Vehicle (LV) plus a 96 m (315 ft.) radius circle about the Spool / Helium Truck with parallel (leg) lines connecting the outer edges of both circles at their centerlines, and running along either side of the Flight Train (up to 240 m (790 ft.) long).



**Launch Limit Area (LLA), Launch Danger Area (LDA), and Launch Hazard Areas (LHA)**

This picture shows the Launch Limit Area (LLA) and Launch Danger Area (LDA). The LLA is the area where the Mobile Launch Vehicle (MLV) is permitted to traverse to conduct the launch. At Fort Sumner the launch pad is an irregular partially paved area that takes advantage of existing runway and paved areas and other drivable surface area for balloon launches. The LDA consisting of a 500 ft. buffer about the LLA shall be enforced about the LLA per the GSP. The LDA has been sized to contain the parachute flight train and the payload given an abort occurs at the LLA resulting in a separation of the balloon from the parachute and payload.

These are further described in the campaign's GSP and the FSP.